

## CARDIOTHORACIC SURGERY

### CT001 WHICH CONDUIT WHERE (FOR CORONARY REVASCLARISATION)

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Evidence for the biologic and prognostic superiority of arterial conduits has accumulated over the past 20 years.

The LITA is unequivocally the conduit of choice for the LAD (patencies 95% at 10 years, and 90% at 20 years).

The RITA has excellent patencies when used to the LAD or diagonal (96% at 10 years). It is best deployed to the circumflex marginals, either as a skeletonised pedicled artery to a high marginal or as a free conduit to mid and inferior OMs (patency 92% at 10 years). The RITA is not adequately versatile for use in the RCA system, particularly for PDA grafting.

The radial artery is the most versatile arterial graft, with patencies of 92% at 5 years to the LAD, 91% at 8 years to the OM, and 88% at 5 years to the PDA, and is an ideal graft in older (>65 years) patients.

The gastroepiploic artery has a 62% ten year patency and is a useful conduit to the PDA – especially in off pump and re-operations.

Composite pedicled grafts (LITA/RA, LITA/RITA) are efficient, ideal for off pump surgery and have excellent patencies (>90% at 5 years) when confined to the LAD and circumflex systems.

Vulnerability from competitive flow limits use of arterial grafts to coronary arteries with stenoses exceeding 80% (50% for LITA).

Vein grafts should always be considered especially in older patients when multiple grafts are required and short operating times desirable. Improved harvesting, aspirin and anti-cholesterol medications have all enhanced the VG patency (90% at 5 years, 60% at 10 years).

Bilateral ITA grafting improves survival (over single ITA), by up to 10% at 10 years and by 20% at 20 years post-operatively. With ideal use of bilateral ITAs to the LAD and OM, leaving RA, VG or GEA for the RCA system.

### CT002 IS CRYOABLATION THE BEST ABLATIVE TECHNIQUE FOR ATRIAL FIBRILLATION

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Traditional COX-MAZE III is the gold standard for correcting chronic and paroxysmal forms of AF in patients undergoing concomitant cardiac surgery. New surgical approaches and energy sources have been trialed lately including cryotherapy to form MAZE like transmural lesions.

Initial promising results with cryoablation using flexible probe have indicated that is a safe and an effective method in treating AF.

We evaluate the Melbourne experience with cryoablation for correction of AF. In present study we will present the preliminary results and the rationale of this technique by comparing the early and intermediate-term data and different applications of cryo-lesions (epicardial vs endocardial). Tailored approach using cryoablation is superior to other energy sources in aspect of minimal collateral damage, creating transmural lesions, ease to use and decreased risk of bleeding and thrombus formation. Freedom of AF is comparable to other ablative techniques.

Based on our small and initial patient cohort cryoablation for treatment of AF is very reliable and safe procedure and our preliminary results are favoring this energy source in carefully selected patients with AF.

### CT003 LEFT ATRIAL REDUCTION FOR ATRIAL FIBRILLATION IN MITRAL VALVE SURGERY

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Atrial fibrillation is common in patients undergoing mitral valve surgery. The initiation of this arrhythmia is related to increase in left atrial size and wall

tension, and is often associated with ectopic foci related to the pulmonary vein orifices. Left atrial reduction diminishes wall tension by decreasing left atrial volume and also isolates the pulmonary veins. From 1996 this procedure was applied to 96 consecutive patients undergoing valve surgery, who were in established atrial fibrillation. All patients had at least a 6 month follow up with a mean follow up of  $1002 \pm 495$  days. There was equal sex distribution and mean age was  $60 \pm 13$  years. Sixty three of the 96 cases underwent mitral valve replacement and 33 mitral valve repair. There was no operative mortality. Three patients had sino-atrial node dysfunction requiring pacemaker. Ninety two per cent are in sinus rhythm. Left atrial reduction is a simple, safe procedure and has proven highly effective in controlling atrial fibrillation in a sustained fashion.

### CT004 THORACOSCOPIC APPROACH TO THE THYMUS

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**Purpose** A minimally invasive approach to the thymus is warranted by virtue of its indications and the population involved. Myasthenia sufferers, in particular, are immune and respiratory compromised.[1] Most patients are young females, in whom a sternotomy or neck incision is cosmetically undesirable, and sternal healing times limit work, sport and driving activities for prolonged periods.

**Methodology** The author's approach and alternative thoracoscopic approaches to the thymus are detailed. Patient selection, and pitfalls and challenges of the approach will be highlighted.

**Results** The results of sixty VATS thymectomies are presented, two-thirds for myasthenia. Remission or some improvement was achieved in 85% of these. Other indications were thymoma, parathyroid adenoma and diagnostic (e.g. lymphoma, thymic mass, duplication cyst).

**Conclusions** The thoracoscopic approach to the thymus allows for an aggressive approach to the conditions that require thymectomy, while providing the patient with minimal surgical insult and rapid recovery. In surgeons with previous thoracoscopic experience, adequate hands-on training with an experienced team should allow acquisition of this skill without a prolonged learning curve.

1. Wright GM, Barnett S, Clarke CP. Video-assisted thoracoscopic thymectomy FOR myasthenia GRAVIS. *Int MED J.* 2002; **32**: 367–371.

### CT005 TRACHEAL RESECTION

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Resection of the trachea has been limited both by the length that can be safely removed without creating undue tension and the relative failure of tracheal grafts.

Benign lesions requiring resection include congenital strictures, post-traumatic and post-intubation stenoses and those caused by chronic infections such as tuberculosis.

The most common malignancies found are squamous cell carcinoma and adenoid cystic carcinoma. Benign tumours are rare.

Resections involving the carina are particularly hazardous and worldwide there are only a few centres with significant numbers for evaluation.

Our recent experience of 14 tracheal resections is presented.

### CT006 THE 'SONAR' (SINGLE OPERATION NODAL ASSESSMENT AND LUNG RESECTION) SYSTEM: SHOULD IT BECOME THE STANDARD OF CARE IN LUNG CANCER SURGERY?

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**Background** The 'SONAR' (Single Operation Nodal Assessment and lung Resection) system for clinically resectable lung cancer involves sequential sampling of Naruke nodal stations 2–10. Mediastinoscopy (My), intrathoracic

mediastinal nodal sampling (IMLNS) and lung resection (LR) are performed as three procedures in the one operative session. The aim of this study was to establish the safety and efficacy of this 'three-in-one' surgical approach to lung cancer staging.

**Method** 281 patients with clinical stage IA-IIIB entered the 'SONAR' protocol between January 2002–December 2005. Patients underwent a My sampling station 2 and 4 nodes. If negative they proceeded to IMLNS of nodal stations 5–10. If negative they proceeded to lung resection. Positive N2 nodes resulted in procedure termination.

**Results** 41/281 patients had positive My (N2-36, N3-5). 36 had positive N2 nodes at IMLNS. The remaining 189 resectable patients underwent LR (144 lobectomy and 45 pneumonectomy). The mortality, and LOS was 0%, 1.4 days for My alone; 0%, and 7.5 days for My + IMLNS; 2.1%, and 6.5 days for My + IMLNS + lobectomy, and 8.8%, and 8.1 days for My + IMLNS + pneumonectomy.

**Conclusions** The 'SONAR' system is a safe, expedient and rational approach to the staging and surgical management of potentially resectable lung cancer. Accurate histopathological staging results in stage-appropriate management of lung cancer patients. It prevents unnecessary thoracotomies and lung resections, and allows for the expedient treatment of advanced (unresectable) lung cancer.

### CT007 APPROPRIATE ROLE OF SURGERY FOR STAGE IIIA LUNG CANCER

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Stage IIIA lung cancer is not one disease entity. It ranges from extensive bulky mediastinal lymph node involvement evident on plain chest X-ray to microscopic nodal metastases detected only because of histological examination of mediastinal lymph nodes resected at the time of pulmonary resection for lung cancer. The appropriate management including the role of surgery is dependent on the sub-group of Stage IIIA and the appropriate management can only be determined with the routine use of PET scanning for accurate staging.

As with locally advanced malignancies of other solid tissue organs, Stage IIIA lung cancer requires a multi-disciplinary approach for effective management and the sequencing of treatment modalities and the precise nature of chemotherapeutic agents employed remains a work in progress. In general terms:

For bulky N2 disease evident on chest X-ray, and M1 disease excluded on PET, management is akin to Stage IIIB non small cell lung cancer concurrent chemo-radiotherapy with no surgery indicated.

For microscopic N2 disease detected following resection, adjuvant chemotherapy and mediastinal radiotherapy is the current preferred treatment regimen.

For N2 disease detected on preoperative PET/CT and confirmed histologically, induction or neo-adjuvant chemotherapy following by surgical resection and adjuvant radiotherapy is the regimen of first choice.

### CT008 REDO AORTIC VALVE SURGERY AFTER AORTIC HOMOGRAFTING

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At the Prince Charles Hospital between 1970 and 2005, 941 aortic homografts have been implanted primarily. Of these 108 have come to reoperation. This paper will not be a scientific description of their natural history thereafter. Rather, technical nuances will be described to deal with what at times is treacherous pathology of the redo allograft – the small aortic root that is now calcific or redo root replacement with a neo-porcelain aorta (the allograft).

**Comment and perception** The aortic allograft as a sub-coronary implant provided superb results but this was operator dependant. To counter this, allograft root replacement came into vogue as the haemodynamic result was more predictable. Unfortunately this changed aortic valve disease to aortic root disease thereafter. This is a major dilemma for the patient – the natural

history remains unknown – and the surgeon who cannot be faint-hearted in dealing with the second phase pathology. The ultimate question remains to be answered over the next ten years of its outcome.

### CT009 AORTIC SURGERY: PERFUSION AND PROTECTION

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At the Royal North Shore hospitals campus between 2000 and 2004 186 complex aortic procedures have been undertaken. Pathologies include acute and chronic aneurysms and dissections involving all segments of the thoracic and thoraco-abdominal aorta.

Axillary cannulation, use of Carmeda circuits and low dose heparin management with deep hypothermic arrest and cerebral oximetry have become mainstays of perfusion practice and will be discussed.

### CT010 PROGRESSION TO CURRENT MANAGEMENT OF STERNOTOMY WOUND PROBLEMS

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Since the description of Median Sternotomy access incisions for cardiac surgery by Julian in 1957, there has always been an attendant complication rate. Mechanical instability, significant infection, and combinations of both may be difficult to treat and control, and there is a mortality rate associated with all advocated surgical approaches, particularly in compromised patients.

This paper will focus on the evolution of techniques available to deal with these complications, currently accepted techniques, and directions.

### CT011 SURGICAL VENTRICULAR RESTORATION

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10 to 30 % of patients who survive major myocardial infarction develop ventricular aneurysm. Large segments of L V show dyskinesia or akinesia. Currently endoaneurysmorrhaphy with or without coronary bypass is the recommended operation of choice. At Narayana Hrudayalaya 154 patients underwent this procedure. 97 of the patients who had surgery between January 2001 and December 2004 are presented in this paper.

Total no.	97
Modified Dor procedure Only.	35
CABG + Dor Procedure	34
CABG +Dor+Mitral Valve Repair	20
“ ” “ ” “ ”+Cryo ablation	3
Closure post Infarct VSD + Dor procedure	5

Aneurysm was antero lateral in 91, lateral in 2 and inferior in 4 patients. The technique used was modified Dor procedure using an oval patch of collagen impregnated Dacron vascular graft. The size was measured to get an ellipsoid shaped ventricle at the end. It was sutured between the scar and normal myocardium using 3 '0' Prolene. The scar was partly excised and then sutured over the repair using 2 '0' Prolene.

**Results** Surgical mortality was 7.2% for the entire series.

Only 48 patients could be followed up for 1 to 3 years at our centre. This is because most of the other patients were from interior areas of north eastern India and Bangladesh. All the patients had 2 D echo and 20 of them L V angio also.

All the patients showed improved L V function. 75% were in NYHA class 1 and 25% in class 11.

**Conclusion** Modified endo aneurysmorrhaphy which excludes the scarred portion and maintains ellipsoid shape of the ventricle gives good immediate and long term results.

### CT012 LEFT VENTRICULAR RECONSTRUCTION BY MODIFIED LINEAR TECHNIQUE WITH ABSORBABLE SUTURE

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**Background** Linear and endoventricular techniques of left ventricular (LV) reconstruction utilize prosthetic material for epicardial reinforcement or endocardial patch. We report a technique of LV aneurysm repair using absorbable suture without prosthetic material.

**Methods** Between November 1999 and August 2004, 55 patients underwent LV reconstruction for ischemic cardiomyopathy. Linear reconstruction of the ventriculotomy using a continuous 3/0 polydioxanone suture without prosthetic material was performed routinely. Clinical outcomes of survival and functional class are reported. Follow up transthoracic echocardiography was used to determine residual LV geometry, the incidence of late mitral incompetence, and the integrity of the repair following dissolution of the suture.

**Results** Fifty-two patients (mean age  $64 \pm 10$  years) were studied. There was no perioperative mortality and the Kaplan-Meier survival at 5 years was 81%. Fifty-one patients underwent postoperative follow-up (mean 28 months) with echocardiography (mean 20 months). There were no recurrent aneurysms. The postoperative LV eccentricity index (EI) was 0.72 (CI 0.48–0.9) with normal LV index being 0.7. Mean LV ejection fraction increased from  $0.33 \pm 0.09$  preoperatively to  $0.41 \pm 0.15$  at late follow up (mean within patient change  $0.08 \pm 0.15$ ,  $p = 0.003$ ). There was improvement in the mean symptom class from  $3.3 \pm 0.8$  to  $1.6 \pm 0.7$  (mean within patient improvement  $1.6 \pm 1.0$ ,  $P < 0.001$ ). Mitral regurgitation of grade 2/4 was identified in 6 patients and grade 3/4 in one patient.

**Conclusion** Linear repair with absorbable suture material and without prosthetic material may be safely undertaken with good early and mid term results.

### CT013 INVESTIGATING THE ROLE OF AQUAPORINS IN DEVELOPMENT OF MYOCARDIAL OEDEMA

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**Purpose** Water accumulation in the heart is important in ischemia/reperfusion injury and operations performed using cardiopulmonary bypass, with cardiac dysfunction associated with myocardial edema being the principal determinant of clinical outcome. An increase in myocardial water exacerbates diastolic dysfunction which is often present preoperatively in structural heart disease.

**Methods** As an initial step in determining the role of aquaporin (AQP) water channels in myocardial edema, we have assessed the myocardial expression of AQPs in humans, rats and mice.

**Results** RT-PCR revealed expression of AQP1, 4, 6, 7, 8 and 11 transcripts in mouse heart. AQP1, 6, 7 and 11 mRNAs were found in rat heart, as well as low levels of AQP4 and 9. Human heart contained AQP1, 3, 4, 5, 7, 9, 10 and 11 mRNAs. AQP1 protein expression was confirmed by Western blot analysis in all three species. AQP4 protein was detected in mouse, but not rat or human heart. To determine the potential functional consequences of myocardial AQP expression, water permeability was measured in plasma membrane vesicles from myocardial cells of wild type vs. various AQP knockout mice. Water permeability was reduced by AQP1 knockout, but not by AQP4 or AQP8 knockout. Using a model of isolated rat heart perfusion, we demonstrate that osmotic and ischemic stresses are not associated with changes in AQP1 or AQP4 expression.

**Conclusions** These studies support a possible functional role of AQP1 in the heart, but indicate that early adaptations to osmotic and ischemic stress do not involve transcriptional or post-translational AQP1 regulation.

### CT014 IN VIVO TISSUE ENGINEERING OF VASCULARISED, SPONTANEOUSLY BEATING, 3-DIMENSIONAL CARDIAC TISSUE

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**Purpose** Engineered cardiac tissue could be used clinically to replace scarred myocardium post myocardial infarction, or experimentally to assess the efficacy and safety of new drugs.

**Methodology** Neonatal rat cardiomyocytes were isolated, cultured, seeded in Matrigel, and placed around an arteriovenous blood vessel loop within a polycarbonate chamber in the groin of an adult nude rat. Chambers were harvested up to 10 weeks later, and some specimens underwent functional testing. All tissue was fixed, embedded in paraffin, sections cut and stained for DAPI, H&E, Massons trichrome and immunostained for Desmin, alpha sarcomeric actin, Connexin-43, Ki67 and Lectin.

**Results** All tissue harvested at 1 week ( $n = 4$ ), 4 weeks ( $n = 8$ ), 5 weeks ( $n = 2$ ) and 10 weeks ( $n = 3$ ) contained cardiomyocytes on staining with desmin and alpha sarcomeric actin. All tissue constructs harvested between 2 and 10 weeks contracted spontaneously at an intrinsic rate (approximately 1 Hz) that was different to that of the host rat. Connexin-43 immunostain identified gap junctions between cardiomyocytes, and Ki67 staining showed that some cardiomyocytes were still dividing at 4 weeks. Profuse vascularisation was seen within all constructs on staining with H&E and Lectin. Functional testing of tissue harvested at 4 and 10 weeks demonstrated a positive chronotropic response to noradrenaline, a positive inotropic response to calcium, and that the tissue could be paced electrically at various rates without tetany.

**Conclusions** Vascularized, spontaneously beating, 3-dimensional cardiac tissue can be grown by placing cardiomyocytes from neonatal rat hearts within a rat tissue engineering chamber.

### CT015 FLUID MECHANICS OF THE AORTIC VALVE

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**Purpose** Aortic valve function is critical for efficient cardiovascular dynamics. The aortic valve must open with minimal pressure difference and close with minimal flow reversal. Understanding the fluid mechanics underlying this process aids the understanding of aortic valve disease.

**Methodology** Medline was searched for the period 1966–2005. Additional research was completed at The University of New South Wales Graduate School of Biomedical Engineering.

**Results** The mechanism of aortic valve closure can be considered as a four phase cycle; opening, quasi-steady, deceleration and flow reversal.

1. At the beginning of systole the valve opens wide and a 3-dimensional vortex is generated with flow entering at the centre of the sinus and exiting at the sinus attachment points.
2. During the quasi-steady phase the vortex produces a pressure distribution which holds the valve cusps in a stable position inside the sinuses.
3. After peak systole the aortic flow decelerates, which causes the pressure in the aorta at the distal ends of the sinuses to fall. The mean pressure on the sinus side of the cusps exceeds that on the aortic side and the valve begins to close.
4. Flow reversal is necessary to produce the final coaptation of the semilunar valve leaflets.

**Conclusions** Sinuses are essential for smooth valve closure. In aortic stenosis no vortices are observed in the sinuses. This induces a low pressure region outside the turbulent jet which results in reduced coronary blood flow. Location of the coronary ostia outside the sinus reduces ostial pressure and coronary flow.

### CT016 PRE-OPERATIVE GLYCAEMIC CONTROL IN DIABETICS UNDERGOING CABG

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**Purpose** Patients with diabetes mellitus who undergo Coronary Artery Bypass Graft (CABG) surgery have poorer outcomes than their non-diabetic counterparts. It has been shown that up to 25% of patients presenting for percutaneous or surgical revascularization suffer from diabetes and that tight intra and post-operative glycaemic control has a bearing on a wide range of post-operative complications. The importance of tight pre-operative control has not yet been assessed and how this should be performed is not agreed upon.

**Methodology** This is a retrospective cohort study of diabetic patients who underwent CABG in a six month period to establish what proportion had glycaemic control assessed pre-operatively and to comment on quality of glycaemic control.

**Results** We found that only 49% had an HbA1c measured in the 30 days prior to surgery with 51% of the results considered abnormal.

**Conclusion** As well as being a marker for elective CABG patients who require tighter pre-operative glycaemic control in preparation for their surgery, we have found HbA1c useful in identifying urgent CABG patients who are likely to need endocrine referral to improve post-operative glycaemic control. A pre-operative HbA1c that reflects good glycaemic control should predict those patients whose random sugars will return to normal once their stress response has abated. What is required now is further study to prove that pre-operative glycaemic control impacts upon outcomes after CABG surgery.

### CT017 CHLAMYDIA PNEUMONIAE IN CORONARY ATHEROSCLEROTIC CALCIFICATION

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**Aim** The factors that initiate coronary atherosclerosis and calcification are unclear. Chlamydia pneumoniae has been implicated in several diseases, including atherosclerosis. The possible association of Chlamydia pneumoniae with calcification in coronary atherosclerosis, has not been previously elucidated.

**Methods** Coronary endarterectomy specimens were harvested from 73 patients (67 males, 6 females), aged 40 to 75 years (average age 58 years) at CABG operation, and analysed by immunohistochemistry, polymerase chain reaction [PCR], and electron microscopy. T – lymphocytes were identified using anti-CD3, macrophages using anti-CD68, and Chlamydia pneumoniae using anti-Chlamydia pneumoniae antibody.

**Results** Calcification was observed in all specimens. Numerous CD3 positive cells [T-cells] and CD68 positive cells [macrophages] were seen within atherosclerotic plaques and areas of calcification. Large numbers of cells that stained positive for the antibody to Chlamydia pneumoniae, were distributed in 69% of specimens within atherosclerotic plaques, especially within areas of calcification, in close association with inflammatory cells.

Chlamydia pneumoniae was identified in 65% of specimens by PCR, and in about 61% of specimens by electron microscopy.

**Conclusions** Chlamydia pneumoniae are present within calcific atherosclerotic coronary artery plaques. Chlamydia pneumoniae, in association with macrophages and T-lymphocytes, may contribute to the chronic inflammatory reactions resulting in calcification of atherosclerotic coronary plaques. This finding may improve the treatment of coronary artery disease since Chlamydia pneumoniae is sensitive to antibiotic therapy.

### CT018 RADIAL ARTERY ANOMALIES FOR CARDIAC SURGEONS

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1. A case involving a rare but important anomaly of the radial artery encountered during a routine radial artery harvest for coronary artery bypass grafting is presented.

2. The most common anomalies of clinical importance to cardiac surgeons are discussed and illustrated.
3. The embryological reasons for these variations and their implications for radial artery harvest are discussed.

**Case Report** A 55 year old man was found to have a left unilateral superficial radial artery passing through the brachioradialis muscle in the proximal third of the forearm. The deep radial artery was a smaller vessel and unsuitable for coronary grafting.

**Results** The most common arterial anomalies of the arm include a proximal bifurcation of the brachial artery, and a superficial brachial artery. In the forearm the superficial ulnar artery is the most common. Anomalies specific to the radial artery include a proximal origin, a bed superficial to the deep fascia, and a path superficial to the brachioradialis muscle (the superficial radial artery).

These variations occur due to the embryological development of the forearm and have varying impacts on the blood supply to the distal limb and the suitability of the radial artery for harvest.

**Conclusion** Although radial artery anomalies are rare, some may be suspected pre-operatively. It is important for surgeons using the radial artery for coronary artery bypass or other forms of reconstruction to be aware of the more common of these anomalies, what effect they may have on the distal limb circulation and how effective the artery will be for its intended use.

### CT019 RESULTS OF FREE RIGHT GASTROEPIPLOIC ARTERY T GRAFTS

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**Purpose** To determine the safety and effectiveness of the free RGEA conduit for coronary artery bypass grafting with a proximal T anastomosis.

**Method** All patient data were obtained from prospectively collected data and the medical records reviewed. Follow up was undertaken by telephone questionnaire to cardiologists and local doctors.

**Results** Between November 1996 and July 2004, 19 patients underwent coronary artery bypass surgery without concomitant valve surgery using a free RGEA T graft. There were 17 males and 2 females and the mean age was 54 years. The mean LV ejection fraction was 46%. Three patients had renal transplants, seven patients underwent redo surgery and 3 patients required coronary endarterectomy for severe disease. In 12 patients the radial artery was considered unsuitable for use.

There were no perioperative deaths.

At the time of follow up (mean 50 months), there had been 3 late deaths and 4 patients had undergone repeat coronary angiography for investigation of angina. The RGEA was widely patent in 3 patients and exhibited a string sign in the fourth.

**Conclusion** Free RGEA T grafts appear safe and reasonably effective in a high risk subgroup of young patients.

### CT020P TRIPLE VALVE ENDOCARDITIS DUE TO STAPHYLOCOCCUS LUGDUNENSIS-A CASE REPORT

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**Introduction** Endocarditis due to Staphylococcus lugdunensis, a recently described coagulase negative staphylococcal species, is rare and fewer than 50 cases have been described so far.

**Method-Case report** We report a case of endocarditis due to Staphylococcus lugdunensis in which the native tricuspid, mitral and aortic valves were infected. Intraoperative pathology included extensive vegetations, abscess formation and intracardiac fistulous tract. The bacterium was isolated on cultures from all the three valves. Appropriate medical and surgical treatment led to a good outcome of the infection. At 1-year follow-up, there was no evidence of recurrence, and the patient showed good functional recovery. She was in New York Heart Association functional class I.

**Discussion** First described in 1988, Staphylococcus lugdunensis, a coagulase negative species, has been identified as a rare cause of endocarditis.

Involvement of mitral valve and aortic valve has been reported in 67% and 33% cases respectively with high mortality. It is likely that it could be found on human skin and mucous membranes however, in the majority of reported cases, the portal of entry was unidentified. Other cases have been described in patients with chronic renal failure or neoplastic disease, and with previous pneumonic episodes.

**Results** Trans-esophageal echo has been a valuable tool to investigate these patients preoperatively and during operation. In our patient a combination of aggressive medical and surgical approach resulted in good outcome.